Claims

What Is Claimed Is:

1. A pressable dental ceramic comprising:

a glass frit;

a glass-ceramic frit comprising leucite; and

a refractory filler having a thermal expansion lower than the thermal expansion of the frits and a refractive index within ±0.2 of the refractive index of the frits;

wherein leucite is present in the dental ceramic in an amount less than about 35% by weight;

wherein the thermal expansion of the dental ceramic is in the range of about 12.5 x 10^{-6}/°C to about 14.5 x 10^{-6}/°C measured from room temperature to 500°C;

wherein the dental ceramic is pressable from about 980 to about 1030°C; and

wherein the dental ceramic can withstand firing of a porcelain onto the dental ceramic without distortion of the dental ceramic at a range from about 830°C to about 900°C.

2. The pressable dental ceramic of claim 1 wherein the refractory filler is selected from the group consisting of silica, cordierite, mullite, alumina, spinel, and mixtures thereof.

3. The pressable dental ceramic of claim 2 wherein the silica is amorphous silica and is selected from the group consisting of fused silica, fumed silica and mixtures thereof.

4. The pressable dental ceramic of claim 1 having a cellular-like microstructure in a prior to pressing and a layered microstructure comprising leucite-rich layers separated by glass-rich layers after pressing.

5. A dental restoration for placement in a person's mouth comprising the pressable dental ceramic of claim 4 wherein the leucite-rich layers and glass-rich layers are oriented normal to the direction of the mastication loads in a person's mouth.

6. The pressable dental ceramic of claim 1 wherein the refractive index of the glass and glass-ceramic frits and the refractive index of the refractory filler are substantially the same or within about ±0.2 of one another.

7. The pressable dental ceramic of claim 1 wherein the glass frit has a glass transition temperature $\geq$ 580°C.

8. The pressable dental ceramic of claim 1 wherein the glass-ceramic frit has a glass transition temperature $\geq$ 600°C.

9. The pressable dental ceramic of claim 1 wherein the glass frit has an average particle size equal to or greater than about six times the average particle size of the glass-ceramic frit.

10. The pressable dental ceramic of claim 10 wherein the glass frit has an average particle size of equal to or greater than about 35 microns and the glass-ceramic frit has an average particle size of equal to or less than about 6 microns.

11. The pressable dental ceramic of claim 1 further comprising a second glass-ceramic frit.

12. The pressable dental ceramic of claim 1 having a three-point bend strength measured per ISO 6872 standard equal to higher than 130 MPa.

13. The pressable dental ceramic of claim 1 having a three-point bend strength measured per ISO 9693 standard equal to higher than 130 MPa.

14. The pressable dental ceramic of claim 1 further comprising one or more of a pigment, opacifying agent and fluorescing agent.

15. The pressable dental ceramic of claim 1 wherein the glass frit is present in an amount from about 40 to about 65 percent by weight, the glass-ceramic frit is present in an amount from about 35 to about 60 percent by weight and the refractory filler is present in an amount from about 0.5 to about 10 percent by weight.

16. A dental restoration comprising;

a pressed core comprising a dental ceramic comprising a glass frit, a glass-ceramic frit comprising leucite, and a refractory filler having a thermal expansion lower than the thermal expansion of the frits and a refractive index within ±0.2 of the refractive index of the frits, wherein leucite is present in the dental ceramic in an amount less than about 35% by weight, and wherein the thermal expansion of the dental ceramic is in the range of about 12.5 x 10^{-6}/°C to about 14.5 x 10^{-6}/°C measured from room temperature to 500°C, wherein the dental ceramic is pressable from about 980 to about 1030°C, and wherein the dental ceramic can withstand firing of a porcelain onto the dental ceramic without distortion of the dental ceramic at a range from about 830 to about 900°C; and

a porcelain overlay on the pressed core having a maturing temperature higher than about 830°C.

17. A dental restoration comprising;

a pressed core comprising a dental ceramic comprising a glass frit, a glass-ceramic frit comprising leucite, and a refractory filler having a thermal expansion lower than the thermal expansion of the frits and a refractive index within ±0.2 of the refractive index of the frits, wherein leucite is present in the dental ceramic in an amount less than about 35% by weight, and wherein the thermal expansion of the dental ceramic is in the range of about 12.5 x 10^{-6}/°C to about 14.5 x 10^{-6}/°C measured from room temperature to 500°C, wherein the dental ceramic is pressable from about 980 to about 1030°C, and wherein the dental ceramic can withstand firing of a porcelain onto the dental ceramic without distortion of the dental ceramic at a range from about 830 to about 900°C; and

a porcelain overlay on the pressed core having a maturing temperature higher than about 830°C;

wherein the difference between the pressing temperature of the core and the firing temperature of the overlay is less than 150°C.

18. The dental restoration of claim 17 wherein the difference between the pressing temperature of the core and the firing temperature of the overlay is less than 110°C.

19. A pressable dental ceramic comprising a:

a glass frit;

a glass-ceramic frit comprising leucite; and

a refractory filler;

wherein the glass frit has an average particle size equal to or greater than about six times the average particle size of the glass-ceramic frit.

20. The presssable dental ceramic of claim 19 wherein the glass frit is present in an amount from about 40 to about 65 percent by weight, the glass-ceramic frit is present in an amount from about 35 to about 60 percent by weight and the refractory filler is present in an amount from about 0.5 to about 10 percent by weight.

21. The pressable dental ceramic of claim 19 wherein the glass frit has an average particle size of equal to or greater than about 35 microns and the glass-ceramic frit has an average particle size of equal to or less than about 6 microns.

22. The pressable dental ceramic of claim 19 having a cellular microstructure prior to pressing and a textured microstructure after pressing.

23. The pressable dental ceramic of claim 19 having a three-point bend strength measured per ISO 6872 standard equal to higher than 130 MPa.

24. The pressable dental ceramic of claim 19 having a three-point bend strength measured per ISO 9693 standard equal to higher than 130 MPa.

25. The pressable dental ceramic of claim 19 wherein the leucite content of the dental ceramic is less than 35 percent by weight.

26. The pressable dental ceramic of claim 19 wherein the dental ceramic is pressable from about 980 to about 1030°C, and wherein the dental ceramic can withstand firing of a porcelain onto the dental ceramic without distortion of the dental ceramic at a range from about 830 to about 900°C.

27. A dental restoration comprising:

a pressed core comprising a glass frit, a glass-ceramic frit comprising leucite, and a refractory filler, wherein the glass frit has an average particle size equal to or greater than about six times the average particle size of the glass-ceramic frit; and

a porcelain overlay on the pressed core having a maturing temperature higher than about 830°C.

28. The dental restoration of claim 27 wherein the pressed core has a textured microstructure.

29. A press-to-metal dental restoration comprising:

a metal framework;

a pressed ceramic overlay, wherein the ceramic overlay comprises a glass frit, a glass-ceramic frit comprising leucite, and a refractory filler having a thermal expansion lower than the thermal expansion of the frits and a refractive index within ±0.2 of the refractive index of the frits, wherein leucite is present in the dental ceramic in an amount less than about 35% by weight, and wherein the thermal expansion of the dental ceramic is in the range of about 12.5 to about 14.5 measured from room temperature to 500°C, wherein the dental ceramic is pressable from about 980 to about 1030°C, and wherein the

dental ceramic can withstand firing of a porcelain onto the dental ceramic without distortion of the dental ceramic at a range from about 830 to about 900°C; and

a porcelain overlay on the pressed ceramic having a maturing temperature higher than about 830°C.

30. A press-to-metal dental restoration comprising:

a metal framework;

a pressed ceramic overlay, wherein the ceramic overlay comprises a glass frit, a glass-ceramic frit comprising leucite, and a refractory filler, wherein the glass frit has an average particle size equal to or greater than about six times the average particle size of the glass-ceramic frit; and

a porcelain overlay on the pressed ceramic having a maturing temperature higher than about 830°C.

31. The dental restoration of claim 5 selected from the group consisting of orthodontic appliances, overlays, bridges, space maintainers, tooth replacement appliances, splints, crowns, partial crowns, dentures, posts, teeth, jackets, inlays, onlays, facing, veneers, facets, implants, abutments, cylinders, and connector.

32. The dental restoration of claim 16 selected from the group consisting of orthodontic appliances, overlays, bridges, space maintainers, tooth replacement appliances, splints, crowns, partial crowns, dentures, posts, teeth, jackets, inlays, onlays, facing, veneers, facets, implants, abutments, cylinders, and connector.

33. The dental restoration of claim 17 selected from the group consisting of orthodontic appliances, overlays, bridges, space maintainers, tooth replacement appliances, splints, crowns, partial crowns, dentures, posts, teeth, jackets, inlays, onlays, facing, veneers, facets, implants, abutments, cylinders, and connector.

34. The dental restoration of claim 19 selected from the group consisting of orthodontic appliances, overlays, bridges, space maintainers, tooth replacement

appliances, splints, crowns, partial crowns, dentures, posts, teeth, jackets, inlays, onlays, facing, veneers, facets, implants, abutments, cylinders, and connector.

35. The dental restoration of claim 27 selected from the group consisting of orthodontic appliances, overlays, bridges, space maintainers, tooth replacement appliances, splints, crowns, partial crowns, dentures, posts, teeth, jackets, inlays, onlays, facing, veneers, facets, implants, abutments, cylinders, and connector.

36. The dental restoration of claim 29 selected from the group consisting of orthodontic appliances, overlays, bridges, space maintainers, tooth replacement appliances, splints, crowns, partial crowns, dentures, posts, teeth, jackets, inlays, onlays, facing, veneers, facets, implants, abutments, cylinders, and connector.

37. The dental restoration of claim 30 selected from the group consisting of orthodontic appliances, overlays, bridges, space maintainers, tooth replacement appliances, splints, crowns, partial crowns, dentures, posts, teeth, jackets, inlays, onlays, facing, veneers, facets, implants, abutments, cylinders, and connector.

38. A method of making a dental restoration comprising:

heating a ceramic pellet or blank to a temperature in the range from about 980°C to about 1030°C and pressing the ceramic pellet or blank, wherein the ceramic pellet or blank comprises a dental ceramic comprising a glass frit, a glass-ceramic frit comprising leucite, and a refractory filler having a thermal expansion lower than the thermal expansion of the frits and a refractive index within ±0.2 of the refractive index of the frits, wherein leucite is present in the dental ceramic in an amount less than about 35% by weight, and wherein the thermal expansion of the dental ceramic is in the range of about 12.5 x 10^{-6}/°C to about 14.5 x 10^{-6}/°C measured from room temperature to 500°C, into a mold space that has been placed in a pressing furnace, whereby the ceramic pellet conforms to the mold space to form a ceramic core;

removing the ceramic core from the mold space;

applying and shaping a dental porcelain powder onto the ceramic core; and

heating the shaped dental porcelain powder to a temperature in the range from about between about 830°C to about 900°C to fuse the dental porcelain powder to the ceramic core.

39. The method of claim 38 wherein the porcelain has a coefficient of thermal in the range of about 12.0 x 10^{-6}/°C to about 14.0 x 10^{-6}/°C in the temperature range of 25°C. to 500°C.

40. A method of making a dental restoration comprising:

forming a metal framework;

heating a ceramic pellet or blank to a temperature in the range from about 980°C to about 1030°C and pressing the ceramic pellet or blank, wherein the ceramic pellet or blank comprises a dental ceramic comprising a glass frit, a glass-ceramic frit comprising leucite, and a refractory filler having a thermal expansion lower than the thermal expansion of the frits and a refractive index within ±0.2 of the refractive index of the frits, wherein leucite is present in the dental ceramic in an amount less than about 35% by weight, and wherein the thermal expansion of the dental ceramic is in the range of about 12.5 x 10^{-6}/°C to about 14.5 x 10^{-6}/°C measured from room temperature to 500°C, onto the metal framework to from a ceramic overlay;

applying and shaping a dental porcelain powder onto the ceramic overlay; and

heating the shaped dental porcelain powder to between about 830°C to about 900°C to fuse the dental porcelain powder to the ceramic core.

41. The method of claim 40 wherein the metal framework comprises a precious,

semiprecious or non-precious alloy.

42. The method of claim 40 wherein metal framework is produced by casting, powder metallurgy or rapid prototyping techniques.

43. The method of claim 42 wherein the casting comprises capillary casting.

44. A method of making a dental restoration comprising:

heating a ceramic pellet or blank to a temperature in the range from about 980°C to about 1030°C and pressing the ceramic pellet or blank, wherein the ceramic pellet or blank comprises a dental ceramic comprising a glass frit, a glass-ceramic frit comprising leucite, and a refractory filler having a thermal expansion lower than the thermal expansion of the frits and a refractive index within ±0.2 of the refractive index of the frits, wherein leucite is present in the dental ceramic in an amount less than or equal to about 35% by weight, wherein the thermal expansion of the dental ceramic is in the range of about 12.5 to about 14.5 measured from room temperature to 500°C, whereby the ceramic pellet conforms to the mold space to form a ceramic core;

removing the ceramic core from the mold space;

applying and shaping a dental porcelain powder onto the ceramic core; and

heating the shaped dental porcelain powder to a temperature in the range from about between about 830°C to about 900°C to fuse the dental porcelain powder to the ceramic core.

45. A method of making a dental restoration comprising:

forming a metal framework;

heating a ceramic pellet or blank to a temperature in the range from about 980°C to about 1030°C and pressing the ceramic pellet or blank, wherein the ceramic pellet or blank comprises a dental ceramic comprising a glass frit, a glass-ceramic frit comprising leucite, and a refractory filler having a thermal expansion lower than the thermal expansion of the frits and a refractive index within ±0.2 of the refractive index of the frits, wherein leucite is present in the dental ceramic in an amount less than or equal to about 35% by weight, wherein the thermal expansion of the dental ceramic is in the range of about 12.5 to about 14.5 measured from room temperature to 500°C, onto the metal framework to from a ceramic overlay;

applying and shaping a dental porcelain powder onto the ceramic overlay; and

heating the shaped dental porcelain powder to between about 830°C to

about 900°C to fuse the dental porcelain powder to the ceramic core.

46. The method of claim 45 wherein the metal framework comprises a precious, semiprecious or non-precious alloy.

47. The method of claim 45 wherein metal framework is produced by casting, powder metallurgy or rapid prototyping techniques.

48. The method of claim 47 wherein the casting comprises capillary casting.